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Quality Assessment and Grading ofDimension Stone in Krishnagiri District, Tamil Nadu, India

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Abstract:*Dimension stone are widely used for monuments, decorative stone, countertops and flooring. Group of crystalline rocks including igneous and metamorphic rocks are used as dimension stone and they are commercially referred as granites.In India, the state of Tamil Nadu, two third of area is covered by igneous and metamorphic terrain, which are widely used for production of commercial granites.The commercial granites made significant contribution to national economic growth. The Krishnagiri district is one of the districts in the state of Tamil Nadu, producing significant volume of dimension stone block, fordomestic usage as well as exporting to foreign countries. In the present study, an assessment has been made to investigate the quality of different type of commercial granites in this region. The dimension stones were assessed through investigation of desired geological quality and associated defects. There are 16 locations identified and rock samples were collected for such quality assessment. The desired qualities were assessed through close megoscopic observations. Rock samples collected from the quarrieswere cut down and thin sections were prepared. Petrological studies were carried out under petrological microscope for identification of minerals and optical properties. Based on the desired quality and associated defects, the granites were graded into four categories as A,B,C &D. The grade A refers to top grade dimension stone with high market value and grade D ranked in the lowest category*.

Keywords:*Dimension stone,Desired quality, Defects, Granites,Grading, Krishnagiri, India*

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I. Introduction

In India, dimension stone made significant contribution to national economic growth. Dimension stone is commonly defined as natural rock quarried for the purpose of cutting and shaping to a specific size for monuments, building decorative stone etc [6, 15].Dimension stone industry is one of the leading industries in the country.India is one of the top most countries in the world exporting dimension stone or otherwise called as commercial granites. The country isexporting nearly US$ 3714 million (Rs.26 billion)worth of stones in the world market. Further, it is expected to increase the quantity of export. The major portions of exported granites are being utilized for monumental stones.The general rock types considered for dimension stone are dolerites, granites, marble, limestone, sandstone and slate. The commercial granitesrefer to any crystalline rock harder than marble with visible mineral grains.In other dimension stone like marble, slate, sandstone and limestone,the mineral grainsare mostly invisible. In addition to granites, the other rocks such as diorite, granodiorite, gabbro, dolerite, anorthosite, syenite, gneiss and schists are generally named as commercial granites. Overall, commercial granites have visible aesthetic mineral grains, amenable to good polish, hard and resist to scratches and acids with attractive granular texture.In true sense, the plutonic igneous and metamorphic rocks are quarried for exporting dimension stone under the banner of granites.

The granites are utilized for monuments, tombstone industries, countertops, tile floors, wall decorative facing materials and stair treads. Overall the polished varieties of granites are used to show impression of elegance and quality in architecture.The price of granite in India is approximately in the range of Rs.150 to Rs.500 (approximately US$ 3to8) per square feet depending upon its colour, granular texture and aesthetic nature. Internationally, the price range from US$ 40 to60 per square feet for countertops. The large exporters of commercial granites in the world are India, Brazil, China, Italy and Norway. Afghanistan is also produced and export significant volume of dimension stone. The practice of using dimension stone for monumental purpose date backs 2800 B.C., were Egyptians used for construction of pyramids. Similarly, Babylonians, Greeks and Romans were extensively used the dimensional

stones as decorative and construction material [16].The physical and aesthetic properties are important for commercial granites. In addition, the granitic mass must be free from fractures so that it can be easily cut from a quarry face in required block size and transported to the polishing unit or directly for shipping.

There are more than 300 varieties of dimension stone sold as "granite" many of which are not granite. In most cases, dimension stone sold as granites includes all granites-feldspathic crystalline rocks, inter-locking texture, variation in colors andindividual grains are visible to the naked eye. Granite includes basic, intermediate igneous and coarse-grained metamorphic rocks. The major commercial granites are white, gray, pink, red and combination of all colors. The minor accessory minerals provide secondary colors like green and brown. Black granites mainly refer to dolerites,which also included in the list of granites, but in true sense it is not granite. Mineralogically, black granites are generally mafic rock types, such as diabase, diorite, dolerite and gabbro. The dimension stone exported from Afghanistan are marketed under the trade names of Black Absolute, Black Galaxy, Colombo Juprana, and Raw Silk, and Tan Brown.The price ranges from $3.10 to $7.75 or more per square foot.Migmatites are classified under commercial granites, often have aesthetically pleasing flow patterns. Syenite also commercially named as granite and it provide excellent polished building facing. Gneisses and marbles are mostly used forattractive dimension stone.

Geological Survey of India (GSI) recognizes the importance of production of dimensionstone granites (DSG) to that nation's economy.GSI promotes granite production through regional evaluations and resource inventories.Several studies were conducted to scientifically grade the granites and fix the marketability rate. Ranjan Babu et al.,[11] have developed systematic methodology to access the quality of granites and made it to several grade. They also develop the technique to access the recovery volume from the quarry.Ranjan Babu and Gupta [10] have made elaborate and detailed research work on therisk associated with granite quarrying in India.Bakhtavar et al.,[5] have assessed the geo-mechanical, inherent, technical and economical parameters which influence the extraction method selection for the dimension stone quarry in Iran.The geo-mechanical and inherent characteristics of the dimension stones include hardness, RQD, compressive strength, joints plane orientation & spacing and water content.Ashmole and Motloung[3] have discussed the best possible practice in exploration of dimension stone and proposed the latest technique in dimension stone quarry activity. Caranassios et al., [7] described the implementation of a sequential process for geological modeling, resource estimation and mine planning connected to granite quarries.Abdollahisharif and Bakhtavar[1]have developed computerized procedure from more than 100 quarry working space for minimize the cutting plane and optimize the size of dimension stone. They find out to reduce the cost of cutting expenditure and minimize the waste products.Bakhtavar and Oraee[4] have mathematically modeled short-term production planning for dimension stone quarries, which minimize the cost of the cutting plane of the quarries.Abdollahisharif et al.,[2] have created geological modeling and production planning for mining of dimension stone in Iran. Their study supported for minimum stone wastage and increases the profit in dimension stone marketing.

In planning of production of natural resources like dimension stone, the quality of the in-situ outcrops priorto extraction needs to be assessed.This is mostly decided on the basis of estimation ofsingle variable such as grade of the stone. There are two problems associated with thistype of assessment in dimension stone quarries. The first problem is the absence of the single variablethat defines stone quality. Indeed, the quality of stone is characterized by a number ofgeological variables such as hardness, strength, texture, structure, fracture, etc. In the second case, the problem related togrouping of blocks into various quality grades.

In the present study, the locations of granite quarries and outcrops in Krishnagiri district was studied in detail and the quality of dimension stone were assessed. The merit of dimension stone at each location was assessed. Similarly, the associated defects at each location were studied carefully. In consideration of the best quality parameters and associated defects, the dimension stone at various locations were grouped into different grades.

II. Study area

The study area is covered in part of Krishnagiri district, Tamil Nadu state, India. It is located in south of Karnataka and Andhra Pradesh states.The investigated area situated in between Northern latitudes of 12˚25' and 12˚61', and Eastern longitudes of 77˚ 75' and 78˚ 40'. The area covers 1500 sq.km and the work carried out on 1:50,000 working scale using Survey of India (SOI) toposheets. The general elevation of the region is about 903m above MSL (Mean Sea Level) around Denkanikottai area, and lowest elevation is 434m above MSL in the southeastern

part near Pochampalli. The topography of the region is highly undulating and covered by massive rock-shoots with fracture zone, which has resemblance of Mysore plateau, with series of rocky hills, interminable undulations,

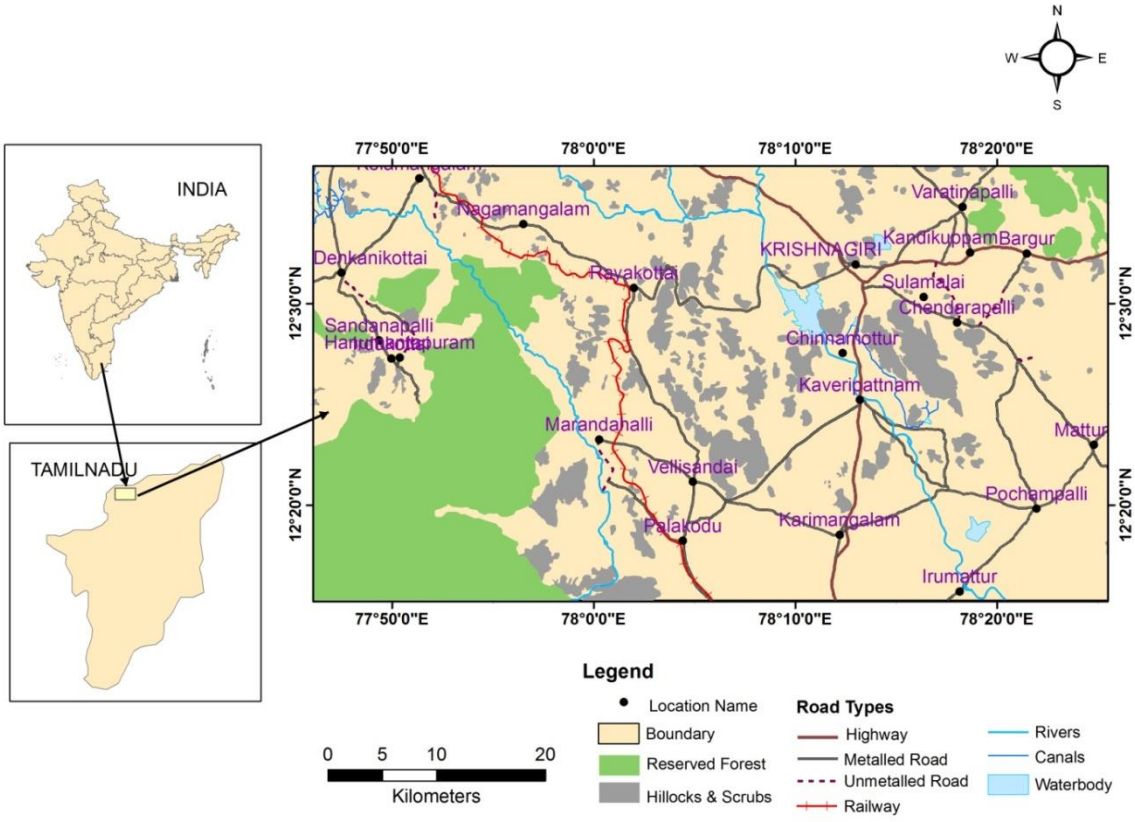


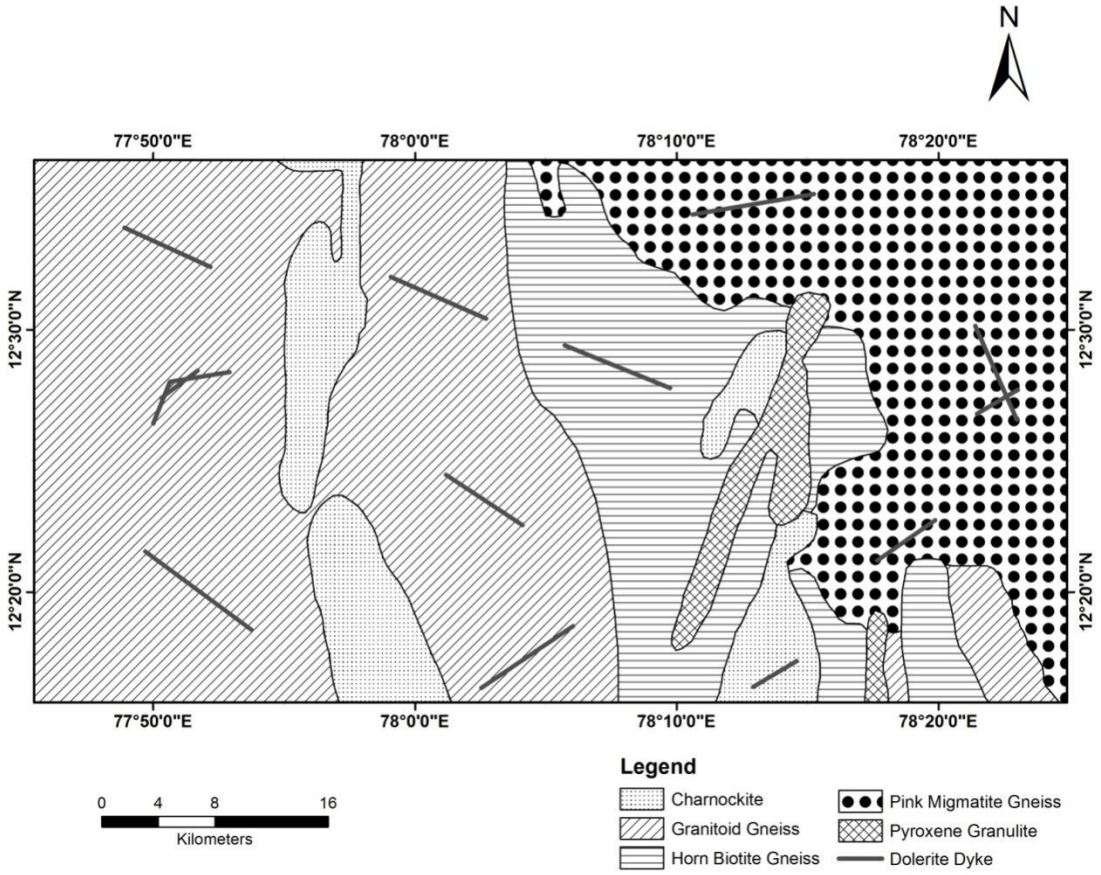
Figure 1. Location map show the part of Krishnagiri district under study

picturesque peaks and verdant valleys. The location map (Figure 1) shows the important locations, road networks, sample locations and major drainage networks. The study area is mainly fall in 3 Taluks of Krishnagiri district, which are Pochampalli, Krishnagiri and Denkanikottai Taluks. A part of Hosur taluk is also included in this survey.

III. Geological Setting

In the state of Tamil Nadu, Precambrian hard rock cover 70% of the geographical area in the western part and remaining 30% covered by sedimentary terrain and river valleys in the eastern part. The study area fall in the Dimbam-Tattakarai-Krishnagiri block (DTK) in the northwest part of the Tamil Nadu state [12]. This region exposed with peninsular gneissic complex with enclaves of Sargur schist and Kolar schist belt extending south from Karnataka state. The most part of the Krishnagiri district covered by Kollegal granulite group of rocks. In this block, the folds are trending in NS to NNE-SSW with marker beds of fuchsite quartzite and amphibolite. Dolerite dykes are trending in all directions mostly in NNE-SSW, NW-SE and EW direction. The geological formations in the study area are mainly covered by Archean age to rocks of Proterozoic period. The Archean rocks comprises of kondalite group of rocks, charnockite group, migmatite complex, Sathiyamangalam group, Bhavani gneissic complex and Kolar group. The migmatites complex includes garnetiferrous quartzo feldspathic gneiss and hornblende biotite gneiss mostly exposed in the western part of the district. The major rock types present in the study area are mostly fall in charnockite group of rocks include granitoid gneiss, pink migmatite gneiss, hornblende biotite gneiss, charnockite, pyroxene granulite and dolerite dykes (Figure 2). The most part of the study area in the eastern part covered by pink migmatite gneiss and in the western part is mostly covered by granitoid gneiss. In pink migmatite gneiss, the pink color clearly visible in outcrop section due to presence of alkali feldspar. The hornblende biotite

gneiss show dark and light color gneissic bands. The light color bands mostly consist of feldspar minerals, quartz and muscovite. The dark color band represents hornblende and biotite minerals. The charnockite formation occupied in the central and southern part of the study area. The gneissic banding also observed at some locations. The major



minerals in this rock are quartz, feldspar, biotite and hypersthene. Dolerite dykes are significantly present in the study area mostly oriented in EW, NS, NW and SE directions. The major minerals in dolerite rocks are plagioclase and clinopyroxenes.

Figure 2. Geology map of the study area

IV. Materials and Methods

The study involved field survey, megoscopic quality assessment and petrographic study. The location of ongoing dimension stone quarry details were collected with the help of available records from the Department of Geology and Mining. The handheld GPS was used to locate the geographic coordinates. The Survey of India topographic maps and GSI resource maps were utilized respectively for entering the location and preparing geology map.Field survey was carried out for site investigation and collection of rock samples. In Krishnagiri district, there are three main type of commercial granites, also referred as dimension stone, were mined out, which are paradiso, multired and black granite. Geologically,they are known as pink migmatite gneiss, granitoid gneiss and dolerites respectively.A close range investigationwas made to study physical characteristics of dimension stone, which are useful to assess the grade of granites. There are 16 fresh rock samples were collected from mine sections as well as from nearby outcrops existed at various locations within the study area (Figure 3). The geographic location details of dimension stone are presented in Table 1. The rock samples were used for preparation of thin sections and identification of minerals.

V. Results and Discussion

Several workers were discussed the quality or decision criteria for assessing the workability and marketability of the dimension stone [3, 8, 11,13 and14].Luodes et al.,[9]

Figure 3. Rock samples collected from dimension stone quarry locations in part of Krishnagiri district

dimension stone, such as the appearance, the reliability of the deposit and the market demand for that particular type of stone.It is important that the color of the dimension stone should be as uniform as possible across the entire deposit.The reliabilityof a deposit is considered as the usage of the dimension stone.Carvalho et al.,[8] provided three important decision making criteria such as dimensioning, homogeneity and fracturing of dimension stone. The dimension criteria indicate a thickness of productive units, total volume of the deposit and spatial disposition. In the case of homogeneity, they mainly emphasize the colour, texture and discontinuities. Fracturing is one of the important decision making criteria which include the preferential direction, frequency, density, intensity and morphology of the fracture.It is necessary to assess the quality criteria to find out the commercial viability of the granites. In this assessment, the geological and geotechnical properties such asthe structure, texture, color, intrinsic designs, discontinuities, fractures, joints, bedding planes and physico-mechanicalproperties of the rocks are play significant role. In dimension stone quarry, the major problem is unable to predict the joint pattern, bedding plane and fractures.

In order to assess the quality of dimension stone and classified into different grades in the Krishnagiri district, a detail survey was conducted at 16 locations covering different varieties of commercial granites. The major commercial granite quarry activities are undergoing mainly in Krishnagiri, Pochampalli and Denkanikottai taluks in the district. The commercial granites are grouped into three varieties, namely paradiso, multired and block granite.

Megoscopic observation was carried out carefully in all locations and the desired qualities of dimension stone were listed out (Table 1). The desired qualities for the grading of the stone include uniform color, aesthetic appearance, granular texture, intrinsic wavy pattern and production dimensionality. The dimension stone has more number of desired qualities, normally graded into top quality. In Krishnagiri district, the desired qualities like wavy pattern and intrinsic design shown in multired variety (Figure 4). The reliability of production or otherwise called dimensionality is important deciding factor for grading the deposit. Figure 5 shows the production dimensionality of the granite deposit at Santhanapalli area, Krishnagiri district.

Figure 4. Desired Quality in multi-red granite; (a) wavy pattern and (b) Intrinsic design

There are number of defects which affect the quality of dimension stone. The major defects in the dimension stone are

- Mole, indicates the segregation of darker minerals and or inclusions in the block
- Flowers, normally specify the concentration of quartz mineral in black granites
- Green lines or streaks, developed in the dimension stone due to alteration of pyroxene into chlorite
- Inclusion of secondary minerals like quartz, calcite, zeolite etc.,
- Presence of hairline cracks, either due to natural phenomina, tectonic disturbances or developed by blasting effects
- Cracks, in the contact zone of quartz veins with ferromagnesium minerals
- Occurrences of crystals of pyrite or marcasite

Figure 5. Santhanapalli multi-red granite in Krishnagiri district show the good productive dimensionality at quarry site 1 and 2

The percentage of recovery volume of the dimension stone from the quarry is affected by some of the defects naturally occurred within the rock mass. In the study area, in addition to assessmentof desired quality, the defects were investigated in all 16 locations and listed out in the table 1 for consideration of grading of the dimension

stone.The imperative defects present in the dimension stone of Krishnagiri district are patches, moles, hairline cracks, uneven mineral distributions, intrusions and joints. These defects will ultimately reduce the yield and market value. Thefigure 6 showsthe presence of patches and moles in the major portion of the paradiso type of dimension stone. In addition, there is a hairline crack present in the left side of the block. Such type of defects leads to discard of block and consider as waste product. The occcurrence of hairline cracks at frequent interval in a dimension stone quarry reduce the yield.Defects such as color and textural variations,uneven assemblage of mineral grains in wavy pattern is also drastically reduce the value of dimension stone (Figure 7).Some times in unavoidable circumstances, cracks may develop in productive dimension stone due to blasting, force to discard the block (Figure 8).The various types of intrusion include mafic dykes, biotite layering and quartz intrusion in the dimension stone are the major defects.Such blocks are not suitable for further marketability (Figure 9). The presence of joints and cracks at closure interval are also reducing the yield and quality of dimension stone (Figure10).

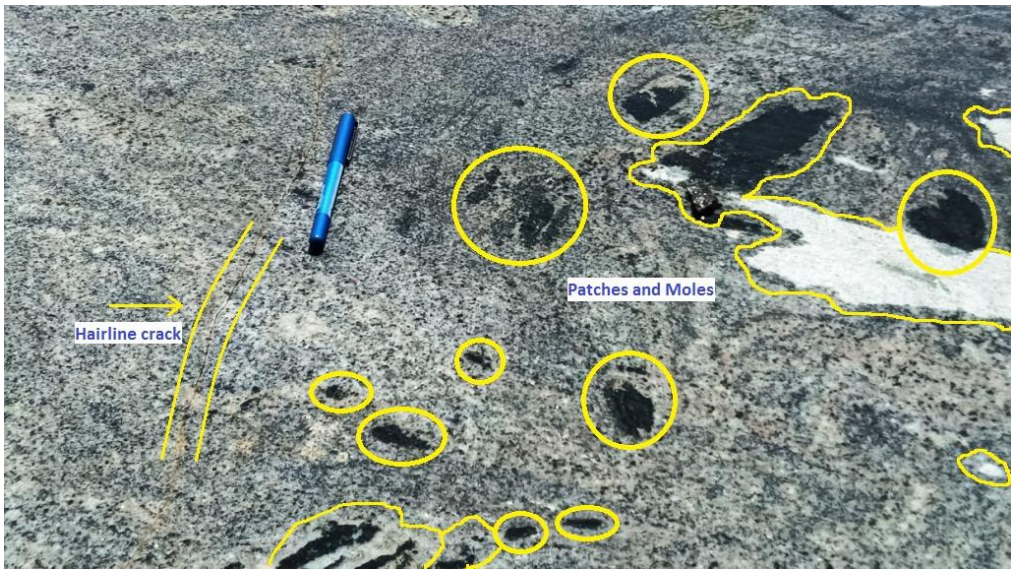


Figure 6. Major defects in the dimension stone, arrow mark show hairline crack and circles indicate the patches and moles

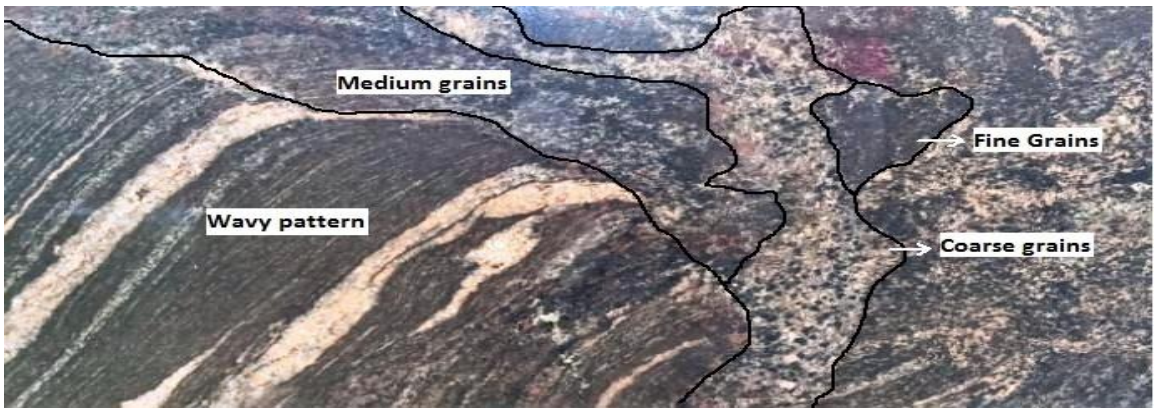


Figure 7. Color and texture variations. Mineral grains are unevenly distributed as fine, medium, coarse grains andwavy pattern

The rock samples were cut into small pieces and utilized for preparations of thin sections for petrological study under Petrological Polarizing microscope. The petrological microscope is equipped with photographic attachment for capturing microphotographs at different scales. The microphotographs of different varieties of granites are

illustrating the various mineral assemblages (Figure 11). In this study, the presence of various minerals and textures In different grades of dimension stone were interpreted. The comparision of megoscopic and microscopic properties

Figure 8. Development ofcrack during quarry activities affects the block into waste product

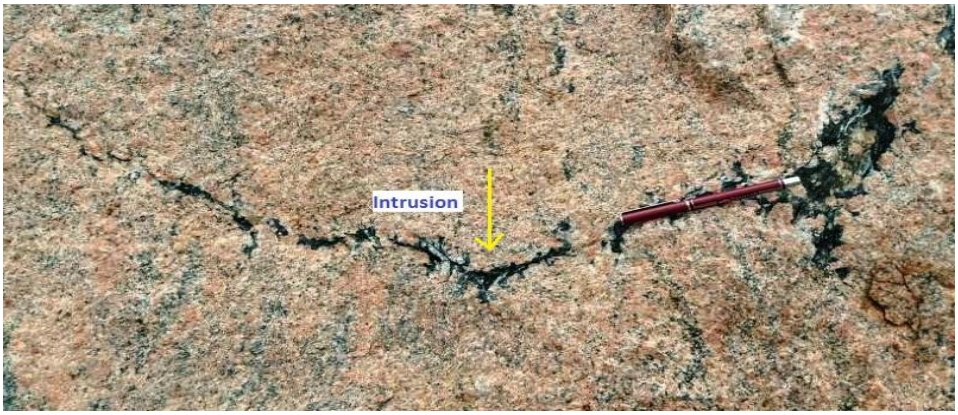


Figure 9. Various types of intrusions, which affect the usable portion of the dimension stone block

Figure 10. Joints and cracks, developed as primary origin or during quarry operations like blasting or at the time of dressing the block

provide valuable guidance in grading the dimension stone.The rocks with medium to fine grained texture, even color and homogeniety support to consider the dimension stone in better grade. Whereas, the rocks with coarse grained texture, uneven distribution of minerals, presence of patchy mafic minerals like biotite and cluster of quartz minerals reduce the grade of the dimension stone. Dolerite dykes have subhedral to anhedral pyroxene minerals with assemblage of plagioclase, mostly fine grained texture. These properties always support for dolerites, commercially known as black granites graded in the top variety.

Multired granite belongs to granitoid gneissic rock, mostly anhedral grains, even distribution of feldspar minerals with acceptable percentage of quartz. These qualities keep the rocks in the standard grade. However, whenever the mafic and opaque minerals dominant, the quality of dimension stone degraded. The feldspar minerals like albite and

microclineprovide multired appearance to the stone. The multired dimension stone always has its value in the market, because of intrinsic design and wavy pattern. The paradiso type of commercial granite mostly belongs to pink migmatite gneiss, comprises of feldspar and quartz minerals. The presence of mafic minerals is comparatly

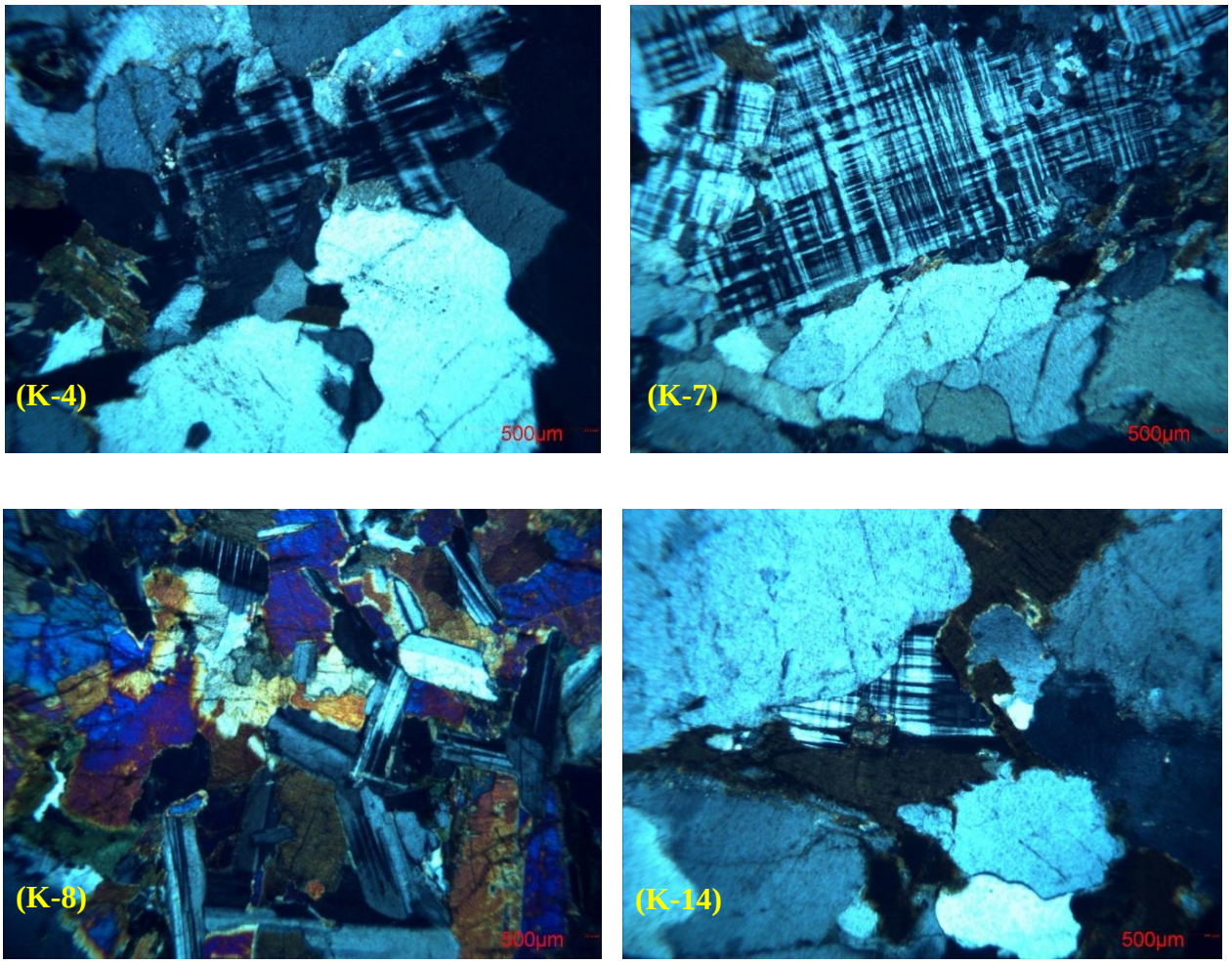


Figure 11. Microphotographs of dimension stone varieties in Krishnagiri district. K(4) –Multired stone at Muthanahalli, under crossed nicol condition, the biotite mineral observed with play of colors, opaque minerals are in dark black color, the feldspar grain show tartan twinning in microcline and whitegrey are quartz minerals. K(7) - Multired stone at Jakkery, under the crossed nicol condition the coarse subhedral grain of feldspar shows tartan twinning, medium grains of quartz are in anhedral formand the opaque minerals are dark black color. K(8) – Black granite at Santhanapalli, under crossed nicolcondition the subhedral to anhedral grains of pyroxene minerals shows 2nd order birefringence color andthe 1st order grey color minerals are of plagioclase feldspar exhibits polysynthetic twinning. K(14) –Paradiso at Nagojanahalli, under crossed nicol condition the four corners covered by coarse grain quartz minerals, the biotite mineral exhibits the play of colors and the feldspar in the centre shows with cross hatch twinning. more in paradiso dimension stone. The photomicrographs of selected dimension stone from Krishnagiri district are shown in the figure 11. The microscopic studies of different dimension stone and respective optical properties are listed in the table 2.

VI. Conclusion

The close range investigation was carried out on dimension stone in the Krishnagiri district has provided some insight in understanding the geology, nature of rocks, quality, defects and grading the stone as per commercial purpose. The various dimension stone in this region were carefully examined in terms of desired quality and

Table 1. Grading of Dimension Stone based on desired quality and defects

Sample ID	Location	Commercial Name	Geological Name	Desired Quality	Defects	Grade
K-1	Sulamalai 12°30'22.28" N 78°17'42.65" E	Paradiso	Pink Migmatite Gneiss	Uniform color and texture, homogeneity, intrinsic design	Minor cracks, Patches and moles, Grey dominant & less pink color	Grade B
K-2	Chendarapalli 12°28'54.99" N 78°18'28.20" E	Paradiso	Pink Migmatite Gneiss	Uniform pattern, wavy appearance	uneven mineral distribution at few spot	Grade B
K-3	Pulikonda 12°27'12.08" N 78°22'10.68" E	Black	Dolerite	High yield, productive dimensionality, medium to fine grain	Minor cracks	Grade A
K-4	Muthanahalli 12°32'46.58" N 77°58'23.52" E	Multired	Granitoid Gneiss	Preferred color and texture	Quartz patches, Fractures, Joints and cracks, less yield	Grade D
K-5	Jakkery 12°34'32.13" N 77°52'58.64" E	Multired	Granitoid Gneiss	High yield, Good color appearance, intrinsic wavy pattern, productive dimensionality	Medium grained	Grade A
K-6	Nagamangalam 12°34'35.27" N 77°55'10.71" E	Paradiso	Pink Migmatite Gneiss	Even color and texture, homogeneity, productive dimensionality	Less wavy appearance	Grade A
K-7	Jakkery 12°34'00.73" N 77°52'06.38" E	Multired	Granitoid Gneiss	Productive dimensionality	Cracks, black mica patches, Grey variety	Grade C
K-8	Santhanapalli 12°28'12.12" N 77°51'23.72" E	Black	Dolerite	Even texture	minor cracks, medium grain	Grade B
K-9	Eruthukottai 12°27'52.14" N 77°50'34.65" E	Black	Dolerite	productive dimensionality	Cracks and joints, medium grain	Grade C
K-10	Anumanthapuram 12°27'35.92" N 77°50'34.58" E	Black	Dolerite	Homogeneity	White patches, Fractures and joints, medium to coarse grain	Grade D
K-11	Santhanapalli 12°27'55.49" N 77°50'28.70" E	Multired	Granitoid Gneiss	Homogeneity, Even texture pattern, Wavy appearance	Black Intrusions	Grade B
K-12	Santhanapalli 12°28'36.66" N 77°50'20.19" E	Multired	Granitoid Gneiss	High yield, productive dimensionality, intrinsic design, medium to fine grained	Minor cracks	Grade A
K-13	Nagojanahalli 12°22'43.00" N 78°16'53.43" E	Paradiso	Pink Migmatite Gneiss	Wavy appearance	More cracks, patches and moles	Grade D
K-14	Nagojanahalli 12°22'38.09" N 78°16'55.39" E	Paradiso	Pink Migmatite Gneiss	Even texture pattern	Uneven mineral distribution, Grey variety	Grade D

K-15	Vilangamudi 12°20'25.47" N 78°18'10.50" E	Paradiso	Pink Migmatite Gneiss	Color pattern	More cracks and joints	Grade C
K-16	Chellampatti 12°20'51.86" N 78°17'55.46" E	Paradiso	Pink Migmatite Gneiss	Homogeneity, Intrinsic designs	Cracks and joints	Grade B

Table 2. Microscopic study of Dimension Stone for assessment of minerals and optical properties

Sample ID	Location	Commercial Name	Geological Name	Minerals	Optical properties	Remarks
K-4	Muthanahalli	Multired	Granitoid Gneiss	Major: Quartz and Feldspar minerals (albite, microcline) Minor: Biotite and mafic opaque minerals	**Quartz**- anhedral grains, undulose extinction, absence of cleavage and 1st order white to yellow. **Feldspar**- 1st order white to grey color, tartan twinning, perthite structure in a wavy pattern **Biotite**- Play of colors with flaky sheet structure **Opaque minerals**- dark black in color	Grade D
K-6	Nagamangalam	Paradiso	Pink Migmatite Gneiss	Major: Quartz and Feldspar minerals (albite, microcline) Minor: Biotite, opaque minerals, calcite and zircon	**Quartz**- anhedral crystal, undulatory extension, absence of clevage **Feldspar**- 1st order white to grey color, tartan twinning, myrmekite structure shows quartz intergrowth in feldspar, perthite structure seen due to potassium and plagioclase feldspar intergrowth. **Biotite**- Play of colors with flaky sheet structure **Opaque minerals**- dark black in color **Calcite**-subhedral grain, perfect rhombohedral cleavage **Zircon**- Euhedral crystal transmits different colours	Grade A
K-7	Jakkery	Multired	Granitoid Gneiss	Major: Quartz and Feldspar minerals (albite, microcline) Minor: Biotite and mafic opaque minerals	**Quartz**- anhedral crystal, undulatory extension **Feldspar**-coarse, subhedral grain, 1st order grey color, cross hatch twinning (microcline), polysynthetic twinning (plagioclase feldspar-albite), myrmekite structure (earth worm like structrure) shows quartz intergrowth in feldspar **Biotite**- Play of colors with flaky sheet structure **Opaque minerals**- dark black in color	Grade C
K-8	Santhanapalli	Black	Dolerite	Major: Pyroxene and Plagioclase Feldspar Minor: Opaque minerals	**Pyroxene**- 2nd order birefringence colors, blue-clinopyroxene, yellowish colour is orthopyroxene. **Feldspar**-1st order grey colour, polysynthetic twinning, symplectite structure shows small feldspar grains are surrounded by the single elongated feldspar grain **Opaque minerals**- associated with pyroxene grains	Grade B
K-14	Nagojanahalli	Paradiso	Pink Migmatite Gneiss	Major: Quartz and Feldspar minerals (albite, microcline) Minor: Biotite and Zircon	**Quartz**-undulose extension, absence of cleavage **Feldspar**-1st order grey color, polysynthetic twinning (albite), cross hatch twinning (microcline), Myrmekite-earth worm like structure-forms quartz intergrowth in feldspar.	Grade D

					Biotite- Play of colors with flaky sheet structure **Zircon**- Euhedral crystal transmits different colours	

presence of defects in the stone. The list of desired quality like homogeniety, aesthatic appearance, production dimensionality and fractureless properties are supporting to cluster the dimension stone quarryinto different grades. In Krishnagiri district, there are three type of dimension stone namelyparadiso, multired and black granites are present. All these varieties have marketable values. In our study, we have identified 16 dimension stone quarry locations under different varieties. Based on our detailed megoscopic and microscopic study, the dimension stones were classified into grade A to D. Out of 16, four locations were classified under grade A, five locations in grade B, three in grade C and four in grade D. The present study support for overall understanding of dimension stone category in Krishnagiri district and derive some methodology for grading the rocks for commercial purpose.

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